What is claimed is:

1. A substrate processing apparatus comprising:

(a) a process chamber comprising:

(i) a substrate support to receive a substrate, the substrate having first and second regions;

(ii) a gas distributor to introduce a gas into the chamber;

(iii) a gas energizer to energize the gas to form features on the substrate; and

(iv) a gas exhaust port to exhaust the gas;

(b) a process monitor to:

(i) monitor a dimension of a pattern of spaced apart and discrete features being formed in the first region of the substrate and generate a first signal; and

(ii) monitor a dimension of a pattern of spaced apart and discrete features being formed in the second region of the substrate and generate a second signal; and

(c) a chamber controller to receive the first and second signals and operate the substrate support, gas distributor, gas energizer, or gas exhaust port, to set process parameters comprising one or more of a gas flow rate, gas pressure, gas energizing power level, and substrate temperature, to process the features in the first and second regions to compensate for any differences in the dimensions of the features being formed in the first and second regions.

2. An apparatus according to claim 1 wherein the chamber controller comprises program code to select and set process parameters to process the features in the first region at a first processing rate and to simultaneously process the features in the second region at a second processing rate, such that at the termination of processing, the dimensions of the features in the first region are substantially identical to the dimensions of the features in the second region.

3.　　An apparatus according to claim 1 wherein the chamber comprises a first processing sector about the first region of the substrate and a second processing sector about the second region of the substrate, and wherein the chamber controller comprises program code to select and set a process parameter at a controllable first level in the first processing sector and at a controllable second level in the second processing sector.

4.　　An apparatus according to claim 3 wherein the chamber controller comprises program code to set the process parameter at the controllable first level directly in proportion to the magnitude of the first signal and sets the process parameter at the controllable second level directly in proportion to the magnitude of the second signal.

5.　　An apparatus according to claim 3 wherein the chamber controller comprises program code to operate the gas distributor to set a gas flow rate at a first flow rate in the first processing sector and a second flow rate in the second processing sector.

6.　　An apparatus according to claim 3 wherein the chamber controller comprises program code to operate the gas energizer to set a gas energizing power level at a first power level about the first processing sector and at a second power level about the second processing sector.

7.　　An apparatus according to claim 3 wherein the chamber further comprises a magnetic field generator to apply a magnetic field within the chamber, and wherein the chamber controller comprises program code to operate the magnetic field generator to set a controllable magnetic field strength at a first field strength about the first processing sector and at a second field strength about the second processing sector.

8.   An apparatus according to claim 1 wherein the chamber controller selects a process recipe from a look-up table stored in a memory of the controller in response to the first and second signals, the look-up table containing a plurality of process recipes, each selected process recipe being related to a pair of first and second signals or a mathematical operand of a pair of first and second signals.

9.   An apparatus according to claim 1 wherein the chamber controller comprises program code to change the process parameters in the chamber from initializing process parameters used in the processing of an initial substrate, to batch process parameters for the processing of a batch of substrates similar in attributes to the initial substrate.

10.   An apparatus according to claim 1 wherein features being formed on the substrate comprise a principal orientation, and wherein the process monitor comprises a first interferometer to detect light reflected from the features being formed in the first region of the substrate to generate the first signal, and a second interferometer to detect light reflected from the features being formed in the second region of the substrate to generate the second signal.

11.   A substrate processing method comprising:

(a)   placing a substrate in a process zone, the substrate having first and second regions;

(b)   introducing a process gas into the process zone;

(c)   energizing the process gas to form a pattern of spaced apart and discrete features on the substrate;

(d)   exhausting the process gas;

(e)   monitoring a dimension of a pattern of spaced apart and discrete features being formed in the first region of the substrate and generating a first signal; and

(f)   monitoring a dimension of a pattern of spaced apart and discrete features being formed in the second region of the substrate and generating a second signal; and

(g)   evaluating the first and second signals and setting process parameters in the process zone to process the features in the first and second regions to compensate for any differences in the dimensions of the features, the process parameters comprising one or more of a gas flow rate, gas pressure, gas energizing power level, and substrate temperature.

12.   A method according to claim 11 comprising setting the process parameters in the process zone to process the features in the first region at a first processing rate and to simultaneously process the features in the second region at a second processing rate so that at the termination of processing, the dimensions of the features in the first region are substantially identical to the dimensions of the features in the second region.

13.   A method according to claim 11 wherein the process zone comprises a first processing sector about the first region of the substrate and a second processing sector about the second region of the substrate, and the method comprises setting a process parameter at a controllable first level in the first processing sector and at a controllable second level in the second processing sector.

14.   A method according to claim 13 comprising setting the process parameter at the controllable first level directly in proportion to the magnitude of the first signal and setting the process parameter at the controllable second level directly in proportion to the magnitude of the second signal.

15.   A method according to claim 13 comprising setting a gas flow rate at a first flow rate in the first processing sector and a second flow rate in the second processing sector.

16.   A method according to claim 13 comprising setting a gas energizing power level at a first power level in the first processing sector and at a second power level in the second processing sector.

17.   A method according to claim 13 comprising setting a controllable magnetic field strength at a first field strength about the first processing sector and at a second field strength about the second processing sector.

18.   A method according to claim 11 comprising changing process parameters in the chamber from initializing process parameters used in the processing of an initial substrate, to batch process parameters for the processing of a batch of substrates similar in attributes to the initial substrate.

19.   A method according to claim 11 comprising detecting light reflected from the first region of the substrate to generate the first signal and detecting light reflected from the second region of the substrate to generate the second signal.

20.   A substrate etching apparatus comprising:

(a)   an etching chamber comprising:

(i)   a substrate support to receive a substrate, the substrate having a central region exposed to a first processing sector of the chamber and a peripheral region exposed to a second processing sector of the chamber;

(ii)   a gas distributor to introduce an etching gas into the chamber;

(iii)   a gas energizer to energize the etching gas to etch features on the substrate;

(iv)   a gas exhaust port to exhaust the etching gas;

(b)   a first light detector to detect light reflected from features being etched at the central region of the substrate and generate a first signal proportional to a measured dimension of the features;

(c)   a second light detector to detect light reflected from features being etched at the peripheral region of the substrate and generate a second signal proportional to a measured dimension of the features; and

(d)   a chamber controller to receive and evaluate the first and second signals and operate the etching chamber to set:

(i)   a process parameter at a controllable first level in the first processing sector, the first level being selected in relation to the first signal, and

(ii)   the process parameter at a controllable second level in the second processing sector, the second level being selected in relation to the second signal,

thereby providing independent monitoring and control of the dimensions of the features being etched at the central and peripheral regions of the substrate.

21.   An apparatus according to claim 20 wherein the chamber controller sets the process parameter at the controllable first level in proportion to a magnitude of the first signal and sets the process parameter at the controllable second level in proportion to a magnitude of the second signal.

22.   An apparatus according to claim 20 wherein the chamber controller operates the gas distributor to set a process parameter comprising an etching gas flow rate at a first flow rate in the first processing sector and a second flow rate in the second processing sector.

23.   An apparatus according to claim 20 wherein the chamber controller operates the gas energizer to set a process parameter comprising a gas energizing power level at a first power level in the first processing sector and at a second power level in the second processing sector.

24.   An apparatus according to claim 20 wherein the chamber further comprises a magnetic field generator to apply a magnetic field within the chamber, and wherein the chamber controller operates the magnetic field generator to set a process parameter comprising a controllable magnetic field strength at a first field strength in the first processing sector and at a second field strength in the second processing sector.

25.   A substrate etching method comprising:

(a)   placing a substrate in a process zone, the substrate having a central region exposed to a first processing sector of the chamber and a peripheral region exposed to a second processing sector of the chamber;

(b)   introducing an etching gas into the process zone;

(c)   energizing the etching gas to etch features on the substrate;

(d)   exhausting the etching gas;

(e)   detecting light reflected from features being etched at the central region of the substrate and generating a first signal proportional to a critical dimension of the features;

(f)   detecting light reflected from features being etched at the peripheral region of the substrate and generating a second signal proportional to a critical dimension of the second features; and

(g)   evaluating the first and second signals and operating the chamber to set:

(i)   a process parameter at a controllable first level in the first processing sector, the first level being selected in relation to the first signal, and

(ii)   the process parameter at a controllable second level in a second processing sector, the second level being selected in relation to the second signal,

thereby providing independent monitoring and control of the critical dimensions of the features at the central and peripheral regions of the substrate.

26.   A method according to claim 25 wherein (g) comprises setting a process parameter comprising an etching gas flow rate at a first flow rate in the first processing sector and a second flow rate in the second processing sector.

27.   A method according to claim 25 wherein (g) comprises setting a process parameter comprising a gas energizing power level at a first power level in the first processing sector and at a second power level in the second processing sector.

28. A method according to claim 25 wherein (g) comprises setting a process parameter comprising a controllable magnetic field strength at a first field strength in the first processing sector and at a second field strength in the second processing sector.

29. A substrate etching apparatus comprising:

    (a) a chamber comprising:

        (i) a substrate support to receive a substrate, the substrate having first and second regions;

        (ii) a gas distributor to introduce an etching gas into the chamber;

        (iii) a gas energizer to energize the etching gas to etch features in the substrate; and

        (iv) a gas exhaust port to exhaust the etching gas;

    (b) a first light detector to detect light reflected from features in the first region of the substrate and generate a first signal proportional to a dimension of the features,

    (c) a second light detector to detect light reflected from the second region of the substrate and generate a second signal proportional to a dimension of the features; and

    (d) a chamber controller to:

        (i) evaluate the first and second signals and select an etching process recipe in relation to the first and second signals; and

        (ii) operate the chamber according to the etching process recipe,

whereby the etching of the features at the first and second regions is independently monitored and controlled.

30. An apparatus according to claim 29 wherein the chamber controller is adapted to select a process recipe comprising a first level of a process parameter in a first processing sector above the first region of the substrate and a second level of the process parameter in a second processing sector above the second region of the substrate.

31.   An apparatus according to claim 29 wherein the chamber controller comprises a memory having a look-up table containing a plurality of process recipes, each process recipe being related to a pair of first and second signals or a mathematical operand of a pair of first and second signals.

32.   A substrate etching method comprising:

(a)   placing a substrate in a process zone, the substrate having first and second regions;

(b)   introducing an etching gas into the process zone;

(c)   energizing the etching gas to etch features on the substrate;

(d)   exhausting the etching gas;

(e)   detecting light reflected from features in the first region of the substrate and generating a first signal;

(f)   detecting light reflected from features in the second region of the substrate and generating a second signal;

(g)   evaluating the first and second signals and selecting an etching process recipe in relation to the first and second signals; and

(h)   setting process parameters in the chamber according to the etching process recipe,

whereby etching of the features at the first and second regions is independently monitored and controlled.

33.   A method according to claim 32 wherein (g) comprises selecting a process recipe comprising (i) a first level of a process parameter in a first processing sector above the first region of the substrate, and (ii) a second level of the process parameter in a second processing sector above the second region of the substrate.

34.   A method according to claim 32 wherein (g) comprises selecting a process recipe from a look-up table containing a plurality of process recipes, each selected process recipe being related to a pair of first and second signals or a mathematical operand of a pair of the first and second signals.